奇美電子
CHIMEI INNOLUX

PRODUCT SPECIFICATION

☐ Tentative Specification
■ Preliminary Specification
☐ Approval Specification

# MODEL NO.: V315B5
# SUFFIX: LE3

**Customer:**

**APPROVED BY**　　　　**SIGNATURE**

Name / Title

**Note**

Please return 1 copy for your confirmation with your signature and comments.

| Approved By | Checked By | Prepared By |
|---|---|---|
| Chao-Chun Chung | Vincent Chou | Archer Chang |

| **Version 1.0** | **1** | **Date：Dec. 20 ,2010** |
|---|---|---|

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## REVISION HISTORY

| Version | Date | Page(New) | Section | Description |
|---------|------|-----------|---------|-------------|
| Ver. 1.0 | Dec. 20, 2010 | All | All | The Preliminary Specification was first issued. |

**Version 1.0** 　　　　　　　　　　　　　　　**4** 　　　　　　　　　　　**Date：Dec. 20 ,2010**

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## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V315B5- LE3 is a TFT Liquid Crystal Display module with LED Backlight unit and 1ch-LVDS interface. The display diagonal is 31.5". This module supports 1366 x 768 HDTV format and can display true 16.7M colors (8-bit/color).

### 1.2 FEATURES

- Optimized Brightness 400 nits

- Contrast Ratio (5000:1)

- Fast Response Time (8.5ms)

- Color Saturation NTSC 72%

- HDTV (1366 x 768 pixels) resolution, HDTV format

- DE (Data Enable) Only Mode

- LVDS (Low Voltage Differential Signaling) Interface

- Viewing Angle: 176(H)/176(V) (CR>20) Super MVA Technology

- Color Reproduction (Nature Color)

- RoHS compliance

### 1.3 APPLICATION

-TFT LCD TVs

-Optimized Brightness, Multi-Media Displays

### 1.4 GENERAL SPECIFICATIONS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 697.685(H) x 392.2(V) | mm | (1) |
| Bezel Opening Area | 705.4(H) x 400 (V) | mm | |
| Driver Element | a-si TFT active matrix | - | - |
| Pixel Number | 1366x R.G.B. x 768 | pixel | - |
| Pixel Pitch(Sub Pixel) | 0.12125 (H) x 0.36375 (V) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Display Colors | 16.7M | color | - |
| Display Operation Mode | Transmissive mode / Normally Black | - | - |
| Surface Treatment | Anti-Glare coating (Haze 11%) Hard Coating (3H) | - | (2) |

### 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size Weight | Horizontal (H) | 734.4 | 735.4 | 736.4 | mm | Module Size |
| | Vertical (V) | 432 | 433 | 434 | mm | |
| | Depth (D) | 9.8 | 10.8 | 11.8 | mm | To Rear |
| | | 30.7 | 31.7 | 32.7 | mm | To Boss |
| | Weight | | 4300 | | g | |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Module Depth does not include connectors.

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## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-----|------|------|
| | | Min. | Max. | | |
| Storage Temperature | TST | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | TOP | 0 | 50 | ºC | (1), (2) |
| Shock (Non-Operating) | SNOP | - | 50 | G | (3), (5) |
| Vibration (Non-Operating) | VNOP | - | 1.0 | G | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta $\leqq$ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 30 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that

**Relative Humidity (%RH)**



**Temperature (ºC)**

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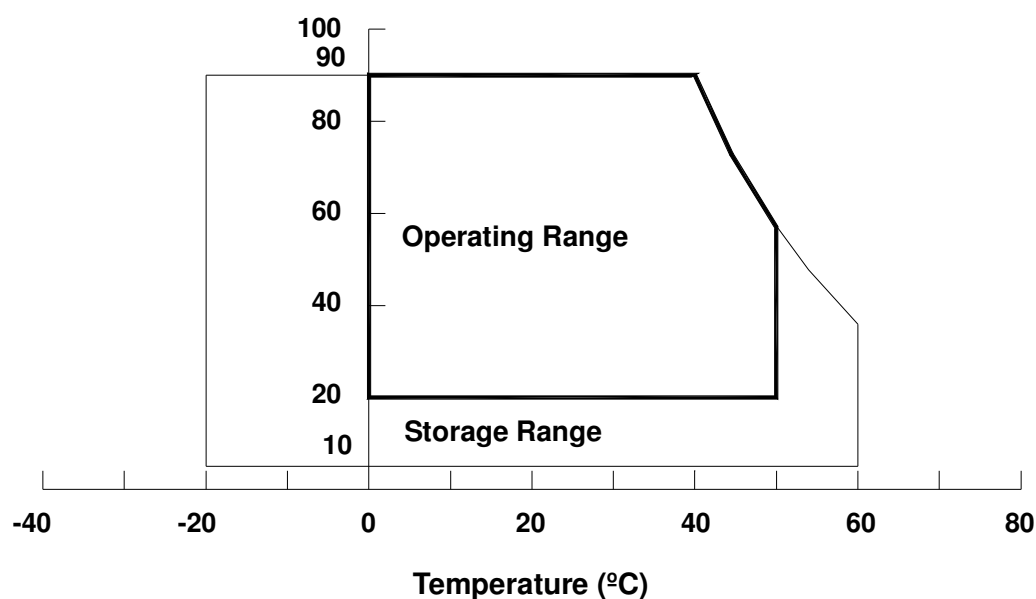
## 2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time, It is highly recommended to store the module with temperature from 0 to 35 ℃ at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

## 2.3 ELECTRICAL ABSOLUTE RATINGS

## 2.3.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-----|------|------|
| | | Min. | Max. | | |
| Power Supply Voltage | VCC | -0.3 | 13.5 | V | (1) |
| Logic Input Voltage | VIN | -0.3 | 3.6 | V | |

## 2.3.2 BACKLIGHT CONVERTER UNIT

| Item | Symbol | Test Condition | Min. | Type | Max. | Unit | Note |
|------|--------|----------------|------|------|------|------|------|
| Light Bar Voltage | $V_W$ | Ta = 25 ℃ | - | - | 60 | V | |
| Converter Input Voltage | $V_{BL}$ | - | 0 | - | 30 | V | (1) |
| Control Signal Level | - | - | -0.3 | - | 7 | V | (1), (3) |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) No moisture condensation or freezing.

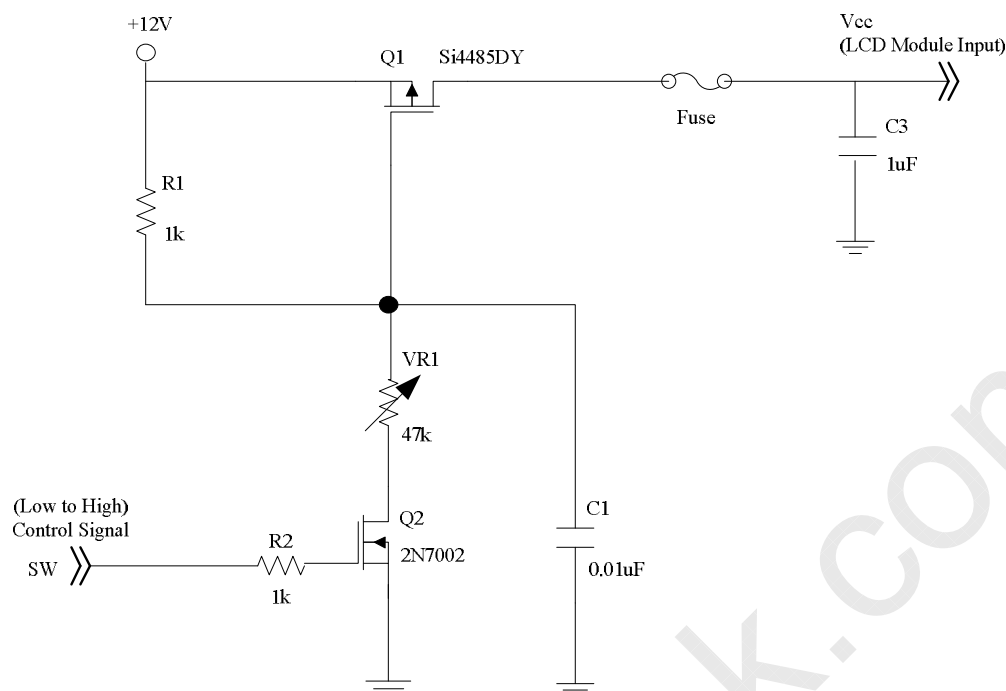Note (3) The control signals include On/Off Control & External Dimming Control.

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## 3. ELECTRICAL CHARACTERISTICS

### 3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Rush Current | | $I_{RUSH}$ | — | — | 3.2 | A | (2) |
| Power consumption | White Pattern | $P_T$ | — | 5.28 | 6.48 | W | (3) |
| | Black Pattern | $P_T$ | — | 3.96 | 4.68 | W | |
| | Horizontal Stripe | $P_T$ | — | 6.12 | 7.44 | W | |
| Power Supply Current | White Pattern | - | - | 0.44 | 0.54 | A | (4) |
| | Black Pattern | — | - | 0.33 | 0.39 | A | |
| | Horizontal Stripe | - | - | 0.51 | 0.62 | A | |
| LVDS interface | Differential Input High Threshold Voltage | $V_{LVTH}$ | +100 | — | — | mV | (5) |
| | Differential Input Low Threshold Voltage | $V_{LVTL}$ | — | — | -100 | mV | |
| | Common Input Voltage | $V_{CM}$ | 1.0 | 1.2 | 1.4 | V | |
| | Differential input voltage(single-end) | $|V_{ID}|$ | 180 | — | 600 | mV | |
| | Terminating Resistor | $R_T$ | — | 100 | — | ohm | |
| CMIS interface | Input High Threshold Voltage | $V_{IH}$ | 2.7 | — | 3.3 | V | |
| | Input Low Threshold Voltage | $V_{IL}$ | 0 | — | 0.7 | V | |

Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:

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+12V

Q1    Si4485DY

Vcc
(LCD Module Input)

Fuse

C3
1uF

R1
1k

VR1
47k

(Low to High)
Control Signal

SW

R2
1k

Q2
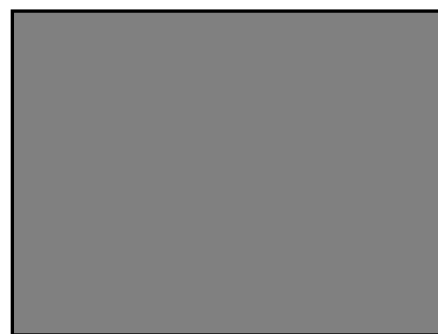2N7002

C1
0.01uF

**<u>Vcc rising time is 470us</u>**

Vcc

0.9Vcc

0.1Vcc

GND

470us
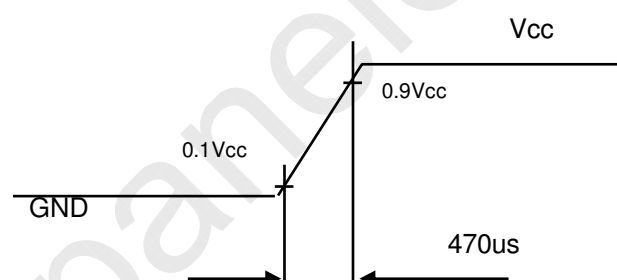
Note (3) The specified power supply current and power consumption is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

b. Black Pattern

Active Area

Active Area

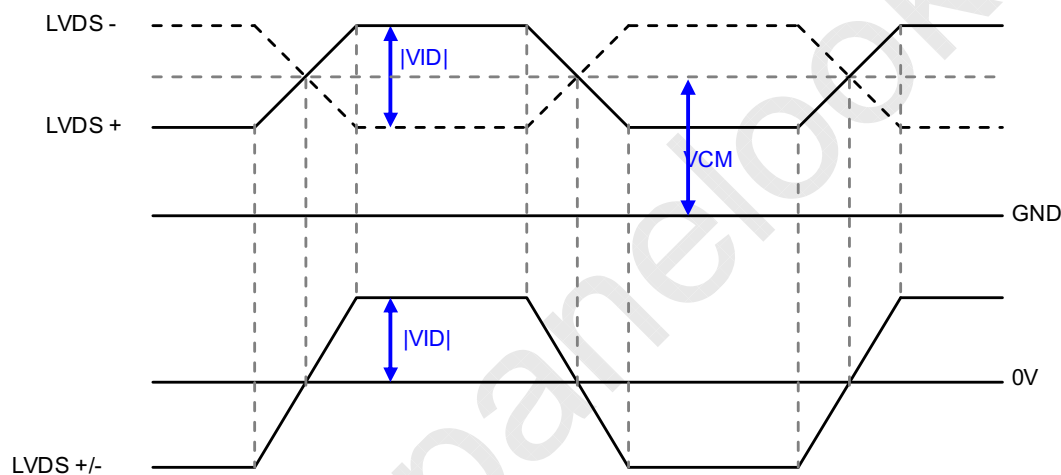# PRODUCT SPECIFICATION

c. Horizontal Pattern
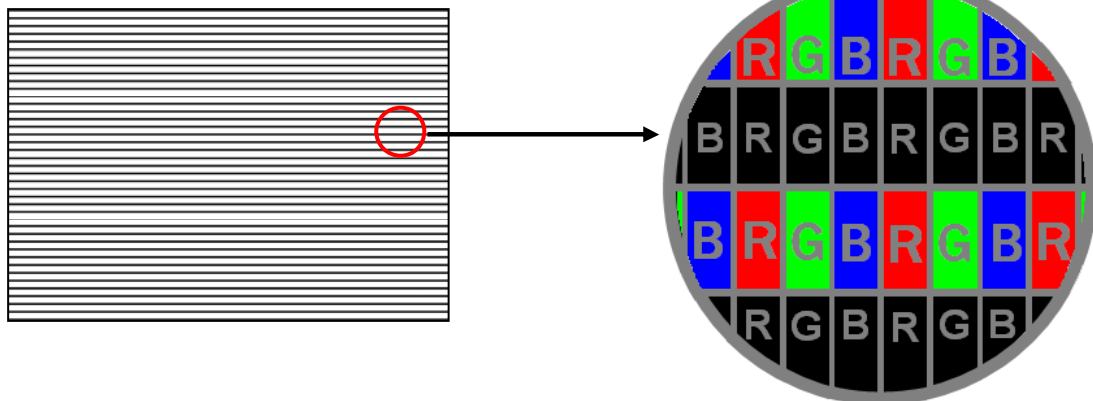


Note (4) The LVDS input characteristics are as follows:

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## 3.2 BACKLIGHT CONNECTOR PIN CONFIGURATION

### 3.2.1 LED LIGHT BARCHARACTERISTICS (Ta = 25 ± 2 ºC)

The backlight unit contains 2pcs light bar.

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Total Current (8 String) | If | - | 800 | 848 | mA | |
| One String Current | $I_L$ | - | 100 | 106 | mA | |
| LED Forward Voltage | $V_f$ | 2.7 | 3.2 | 3.6 | $V_{DC}$ | $I_L$ =100mA |
| One String Voltage | $V_W$ | 32.4 | - | 43.2 | $V_{DC}$ | $I_L$ =100mA |
| One String Voltage Variation | $\triangle V_W$ | - | - | 2 | V | |
| Life time | - | 30,000 | - | - | Hrs | (1) |

Note (1) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2℃, $I_L$ =100mA.

### 3.2.2 CONVERTER CHARACTERISTICS (Ta = 25 ± 2 ºC)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Power Consumption | $P_{BL}$ | - | 34 | 38.4 | W | (1),(2) IL = 100 mA |
| Converter Input Voltage | $V_{BL}$ | 22.8 | 24 | 25.2 | $V_{DC}$ | |
| Converter Input Current | $I_{BL}$ | - | 1.4 | 1.6 | A | No Dimming |
| Input Inrush Current | - | - | - | 2.2 | A | $V_{BL}$=24V, (IL=100mA) (3) |
| Dimming Frequency | $F_B$ | 150 | 160 | 170 | Hz | |
| Minimum Duty Ratio | $D_{MIN}$ | 5 | 10 | - | % | (4) |

Note (1) The power supply capacity should be higher than the total converter power consumption $P_{BL}$. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when converter dimming.

Note (2) The measurement condition of Max. value is based on 31.5" backlight unit under input voltage 24V, average LED current 106 mA and lighting 1 hour later.

Note (3) The duration of Input Inrush Current is about 30ms.

Note (4) 5% minimum duty ratio is only valid for electrical operation.

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### 3.2.3 CONVERTER INTERFACE CHARACTERISTICS

| Parameter | | Symbol | Test Condition | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | | |
| On/Off Control Voltage | ON | VBLON | — | 2.0 | — | 5.0 | V | (6) |
| | OFF | | — | 0 | — | 0.8 | V | |
| External PWM Control Voltage | HI | VEPWM | — | 2.0 | — | 5.25 | V | Duty on / (5) |
| | LO | | — | 0 | — | 0.8 | V | Duty off |
| Error Signal | | ERR | — | — | — | — | — | Abnormal: Open collector Normal: GND (4) |
| VBL Rising Time | | Tr1 | — | 30 | — | — | ms | 10%-90%$V_{BL}$ |
| Control Signal Rising Time | | Tr | — | — | — | 100 | ms | |
| Control Signal Falling Time | | Tf | — | — | — | 100 | ms | |
| PWM Signal Rising Time | | TPWMR | — | — | — | 50 | us | |
| PWM Signal Falling Time | | TPWMF | — | — | — | 50 | us | |
| Input Impedance | | Rin | — | 1 | — | — | MΩ | |
| PWM Delay Time | | TPWM | — | 1 | — | — | ms | |
| BLON Delay Time | | $T_{on}$ | — | 300 | — | — | ms | |
| | | $T_{on1}$ | — | 300 | — | — | ms | |
| BLON Off Time | | Toff | — | 300 | — | — | ms | |

Note (1) The Dimming signal should be valid before backlight turns on by BLON signal. It is inhibited to change the external PWM signal during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the Fig.1. For a certain reason, the converter has a possibility to be damaged with wrong power sequence and control signal timing.

Note (3) While system is turned ON or OFF, the power sequences must follow as below descriptions:

　　　　Turn ON sequence: VBL → PWM signal → BLON

　　　　Turn OFF sequence: BLOFF → PWM signal → VBL

Note (4) When converter protective function is triggered, ERR will output open collector status.

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.2.

Note (6) The BLON interface that inserts a pull up resistor to 5V, please refers to Fig.2.
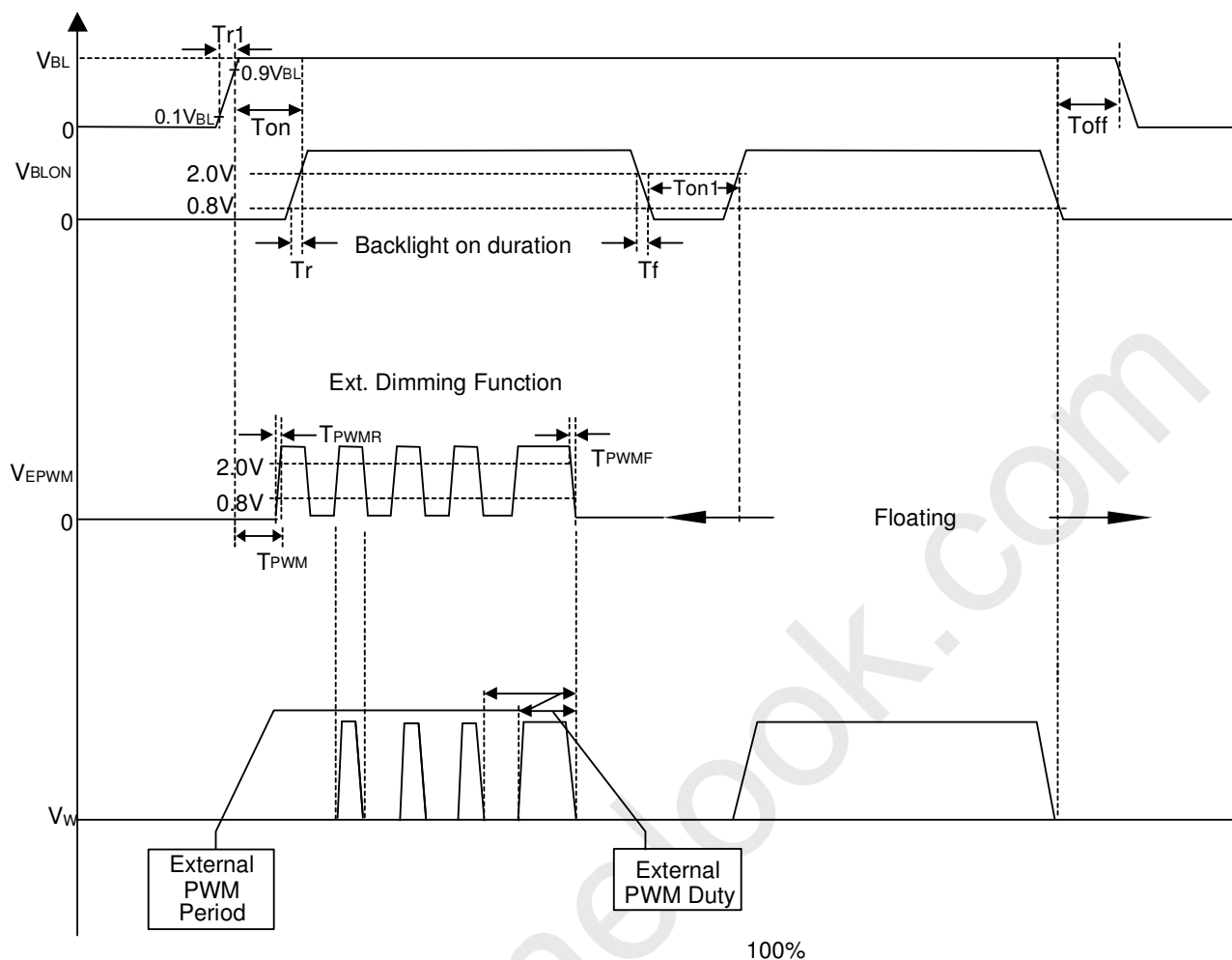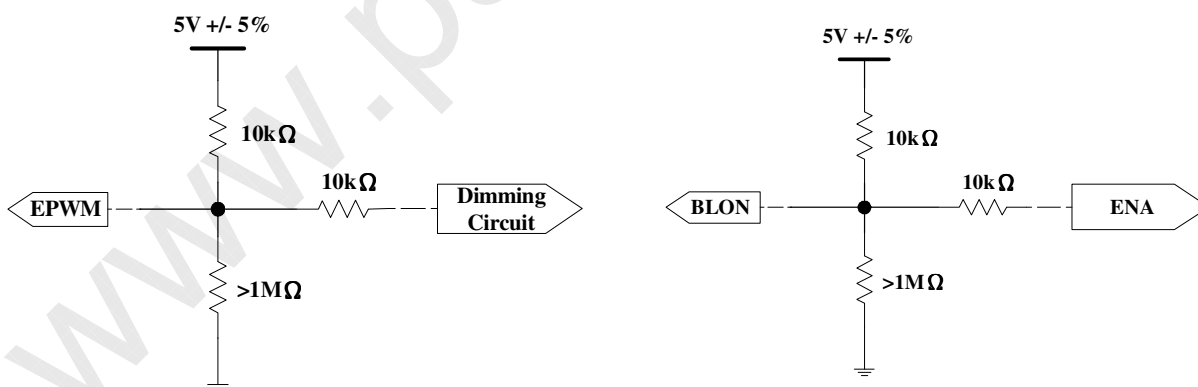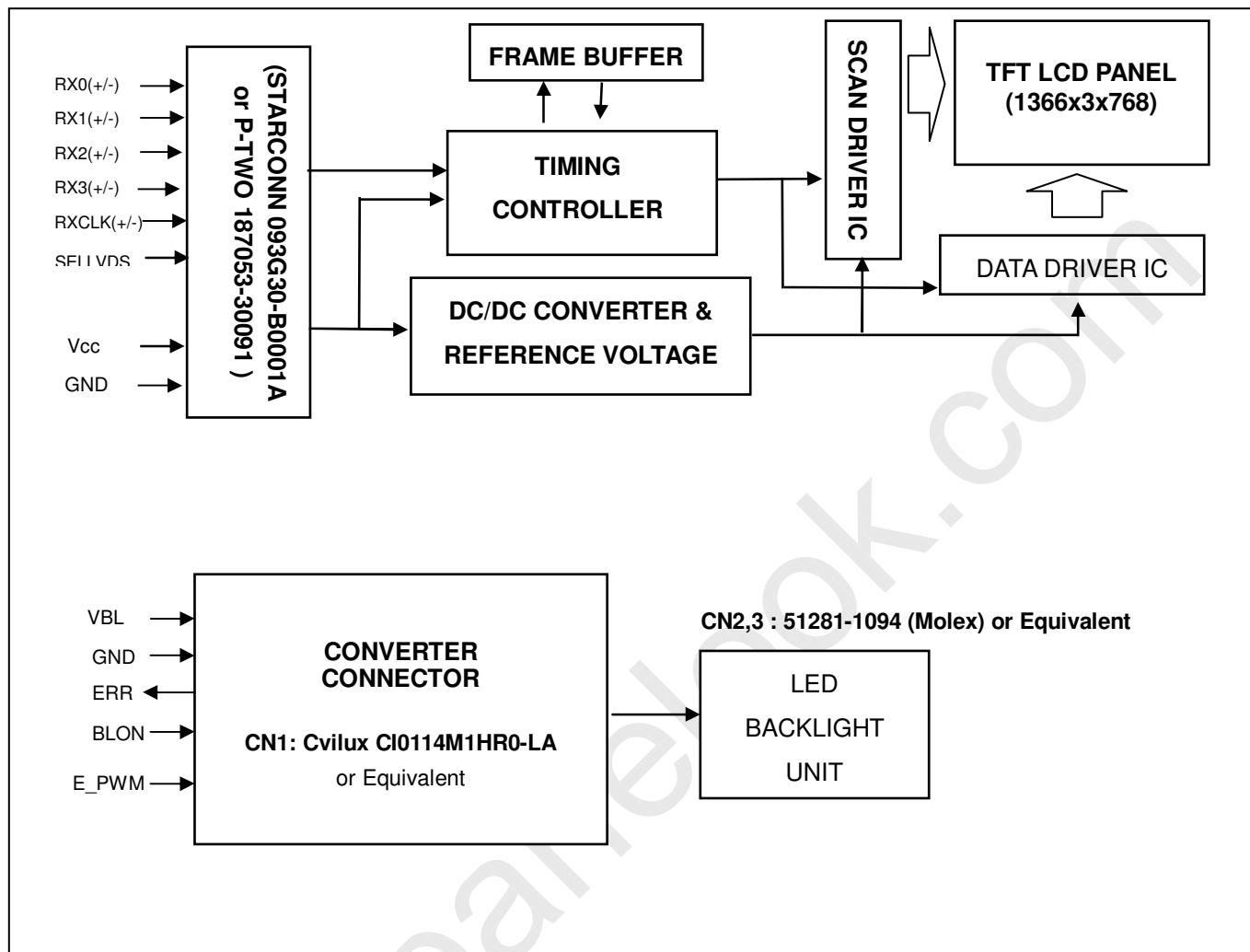
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Fig. 1



Fig. 2

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## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE

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## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

#### CNF1 Connector Pin Assignment

| Pin No. | Symbol | Description | Note |
|---------|--------|-------------|------|
| 1 | VCC | Power supply: +12V | |
| 2 | VCC | Power supply: +12V | |
| 3 | VCC | Power supply: +12V | |
| 4 | VCC | Power supply: +12V | |
| 5 | GND | Ground | |
| 6 | GND | Ground | |
| 7 | GND | Ground | |
| 8 | NC | No connection | (3) |
| 9 | SELLVDS | Select LVDS data format | (2),(4) |
| 10 | GND | Ground | |
| 11 | GND | Ground | |
| 12 | RX0- | Negative transmission data of pixel 0 | |
| 13 | RX0+ | Positive transmission data of pixel 0 | |
| 14 | GND | Ground | |
| 15 | RX1- | Negative transmission data of pixel 1 | |
| 16 | RX1+ | Positive transmission data of pixel 1 | |
| 17 | GND | Ground | |
| 18 | RX2- | Negative transmission data of pixel 2 | |
| 19 | RX2+ | Positive transmission data of pixel 2 | |
| 20 | GND | Ground | |
| 21 | RXCLK- | Negative of clock | |
| 22 | RXCLK+ | Positive of clock | |
| 23 | GND | Ground | |
| 24 | RX3- | Negative transmission data of pixel 3 | |
| 25 | RX3+ | Positive transmission data of pixel 3 | |
| 26 | GND | Ground | |
| 27 | NC | No connection | (3) |
| 28 | NC | No connection | (3) |
| 29 | NC | No connection | (3) |
| 30 | GND | Ground | |

Note (1) LVDS connector pin order defined as follows

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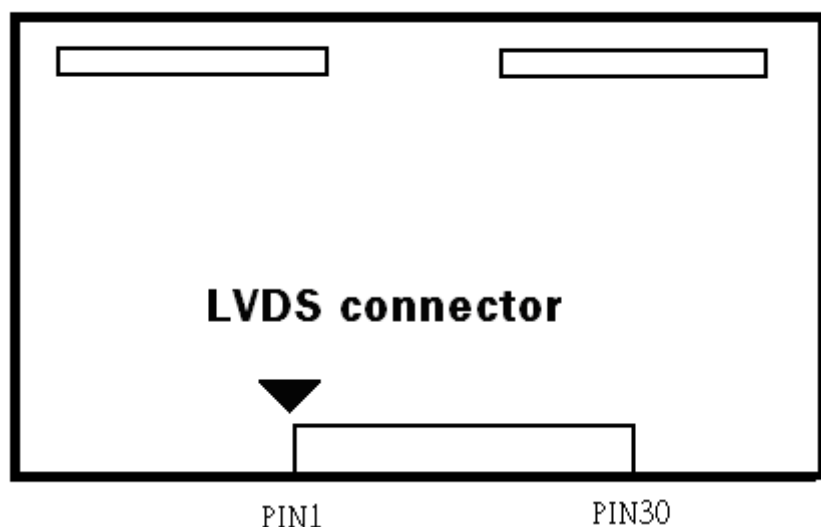


Note (2) Low = Open or connect to GND: VESA Format, High = Connect to +3.3V: JEIDA Format.

Note (3) Reserved for internal use. Please leave it open.

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be
less than 1K Ohm. (R1 < 1K Ohm)

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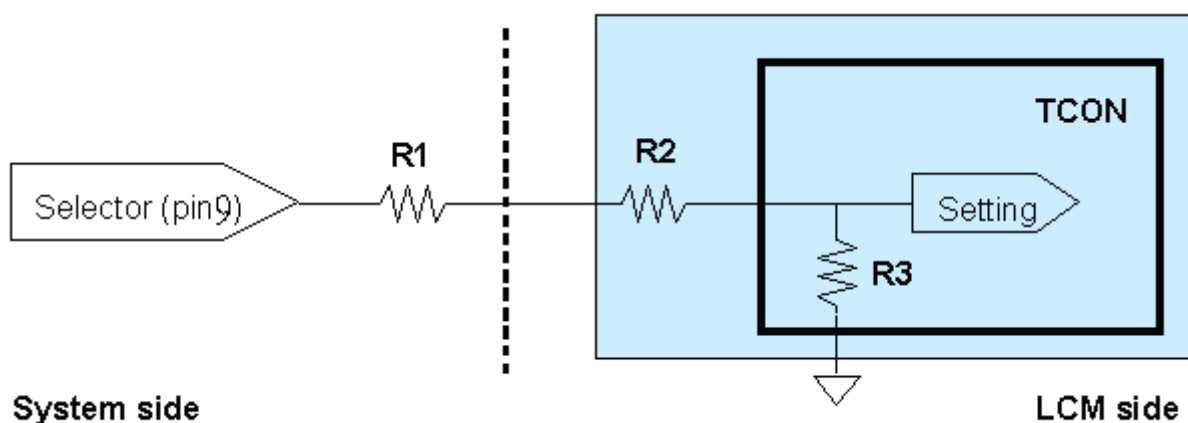
## 5.2 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.
CN: 51281-1094 (Molex) or Equivalent

| Pin № | Symbol | Feature |
|---|---|---|
| 1 | VLED+ | Positive of LED String |
| 2 | | |
| 3 | NC | NC |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | N1 | Negative of LED String |
| 8 | N2 | |
| 9 | N3 | |
| 10 | N4 | |

## 5.3 CONVERTER UNIT

CN1(Header): Cvilux CI0114M1HR0-LA or Equivalent

| Pin № | Symbol | Feature |
|---|---|---|
| 1 | VBL | +24V |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | GND | GND |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | ERR | Normal (GND) Abnormal (Open collector) |
| 12 | BLON | BL ON/OFF |
| 13 | NC | NC |
| 14 | E_PWM | External PWM Control |

Note (1) If Pin14 is open, E_PWM is 100% duty.

Note (2) If Pin12 is open, BLU is turned on.

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CN2(Header): 51281-1094 (Molex) or Equivalent

| Pin № | Symbol | Feature |
|---|---|---|
| 1 | VLED+ | Positive of LED String |
| 2 | | |
| 3 | NC | NC |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | N1 | Negative of LED String |
| 8 | N2 | |
| 9 | N3 | |
| 10 | N4 | |

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory!  www.panelook.com

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## 5.4 BLOCK DIAGRAM OF INTERFACE

CNF1
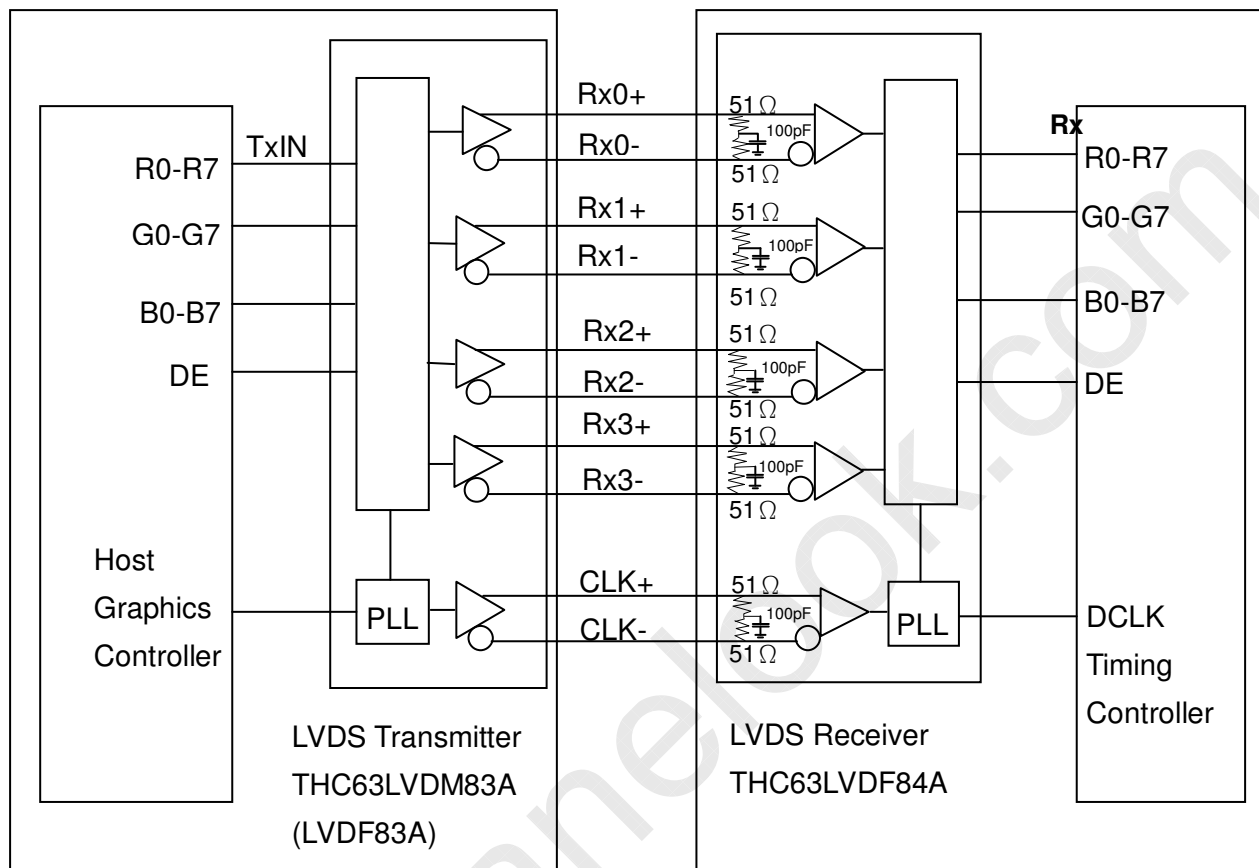


R0~R7 : Pixel R Data

G0~G7 : Pixel G Data
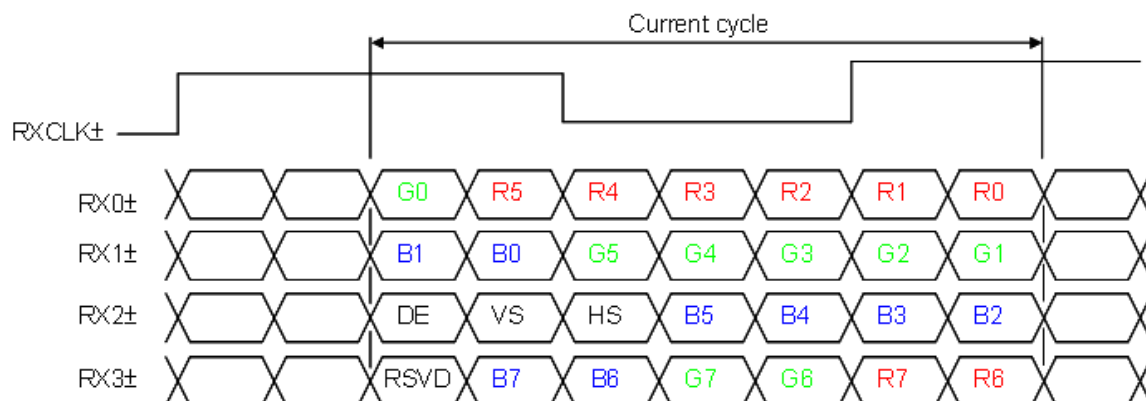
B0~B7 : Pixel B Data

DE　　 : Data Enable Signal

DCLK　 : Data clock signal

Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is
used differentially.

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**5.5 LVDS INTERFACE**

VESA LVDS format：(SELLVDS pin=L or open)



JEIDA LVDS format：(SELLVDS pin=H)
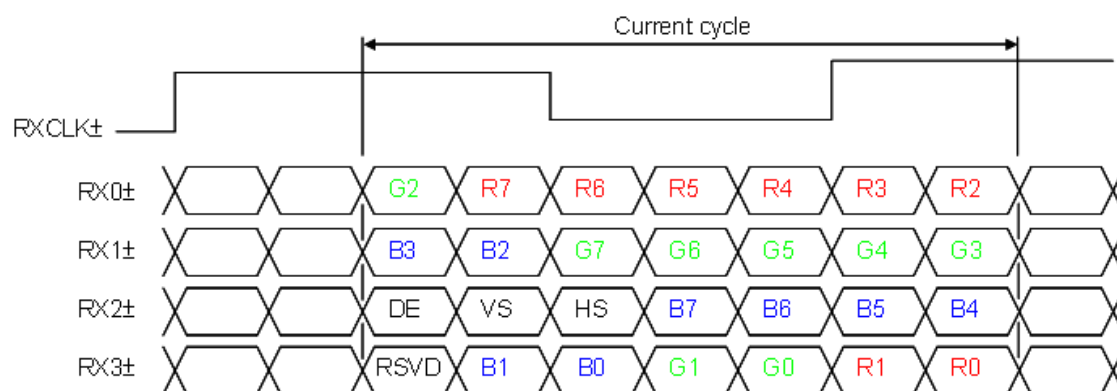


R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE: Data enable signal

Notes(1) RSVD(reserved)pins on the transmitter shall be "H" or( "L" or OPEN)

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## 5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

PRODUCT  SPECIFICATION

## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS (Ta = 25 ± 2 ºC)

The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | $F_{clkin}$ (=1/TC) | 60 | 76 | 82 | MHz | |
| | Input cycle to cycle jitter | $T_{rcl}$ | — | — | 200 | ps | (3) |
| | Spread spectrum modulation range | $F_{clkin\_mod}$ | $F_{clkin}$-2% | — | $F_{clkin}$+2% | MHz | (4) |
| | Spread spectrum modulation frequency | $F_{SSM}$ | | | 200 | KHz | |
| LVDS Receiver Data | Setup Time | Tlvsu | 600 | — | — | ps | (5) |
| | Hold Time | Tlvhd | 600 | — | — | ps | |
| Vertical Active Display Term | Frame Rate | $F_{r5}$ | 47 | 50 | 53 | Hz | |
| | | $F_{r6}$ | 57 | 60 | 63 | Hz | |
| | Total | Tv | 776 | 806 | 1018 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 768 | 768 | 768 | Th | — |
| | Blank | Tvb | 8 | 38 | 250 | Th | — |
| Horizontal Active Display Term | Total | Th | 1442 | 1560 | 2006 | Tc | Th=Thd+Thb |
| | Display | Thd | 1366 | 1366 | 1366 | Tc | — |
| | Blank | Thb | 76 | 194 | 640 | Tc | — |

Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic
level. Otherwise, this module would operate abnormally.

Note (2) Please make sure the range of pixel clock has follow the below equation：

Fclkin(max) $\geqq$ Fr6 ╳ Tv ╳ Th

Fr5 ╳ Tv ╳ Th $\geqq$ Fclkin(min)

PRODUCT SPECIFICATION

Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below：

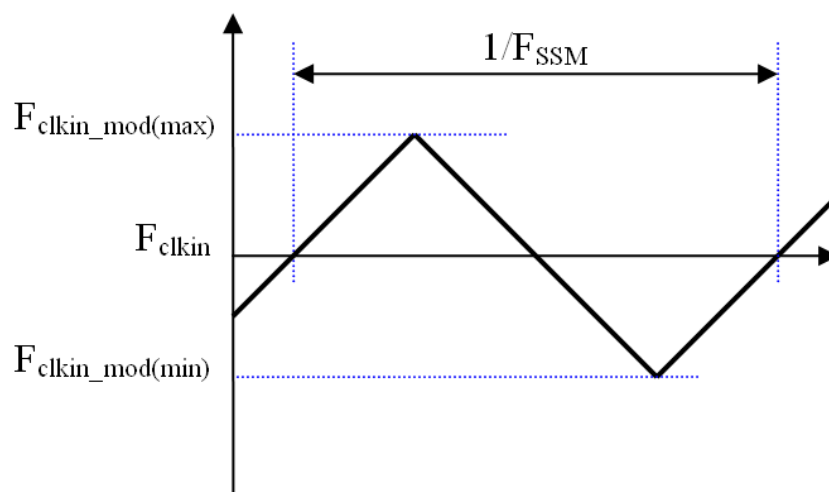**INPUT SIGNAL TIMING DIAGRAM**
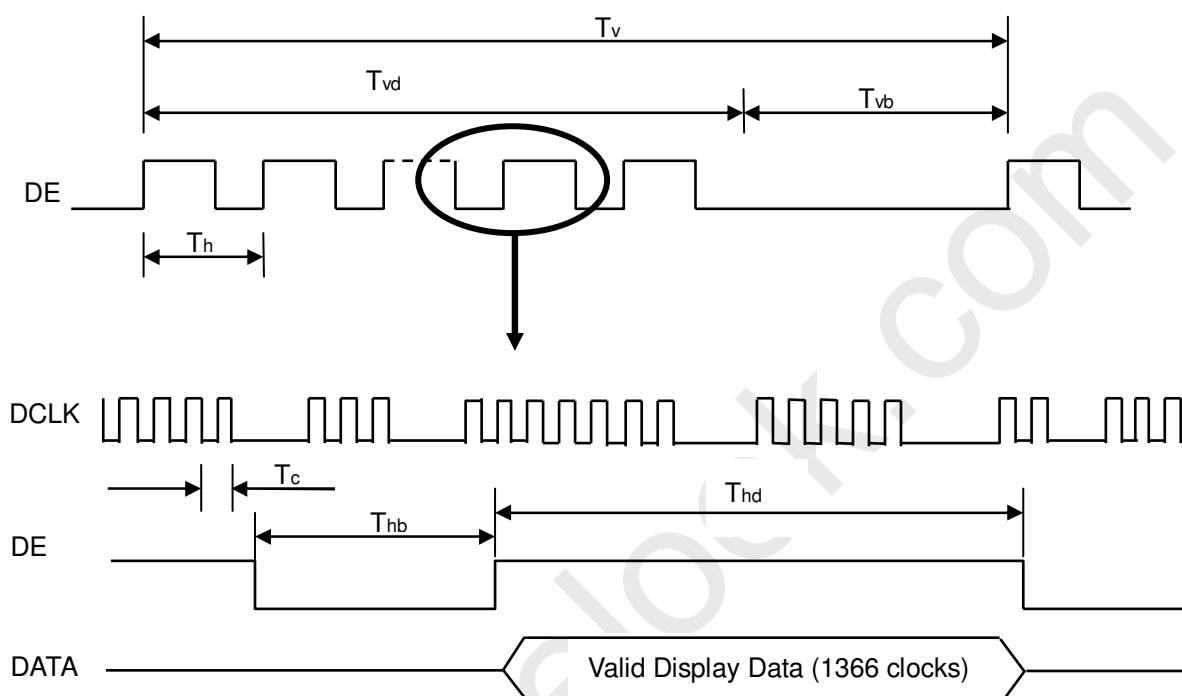


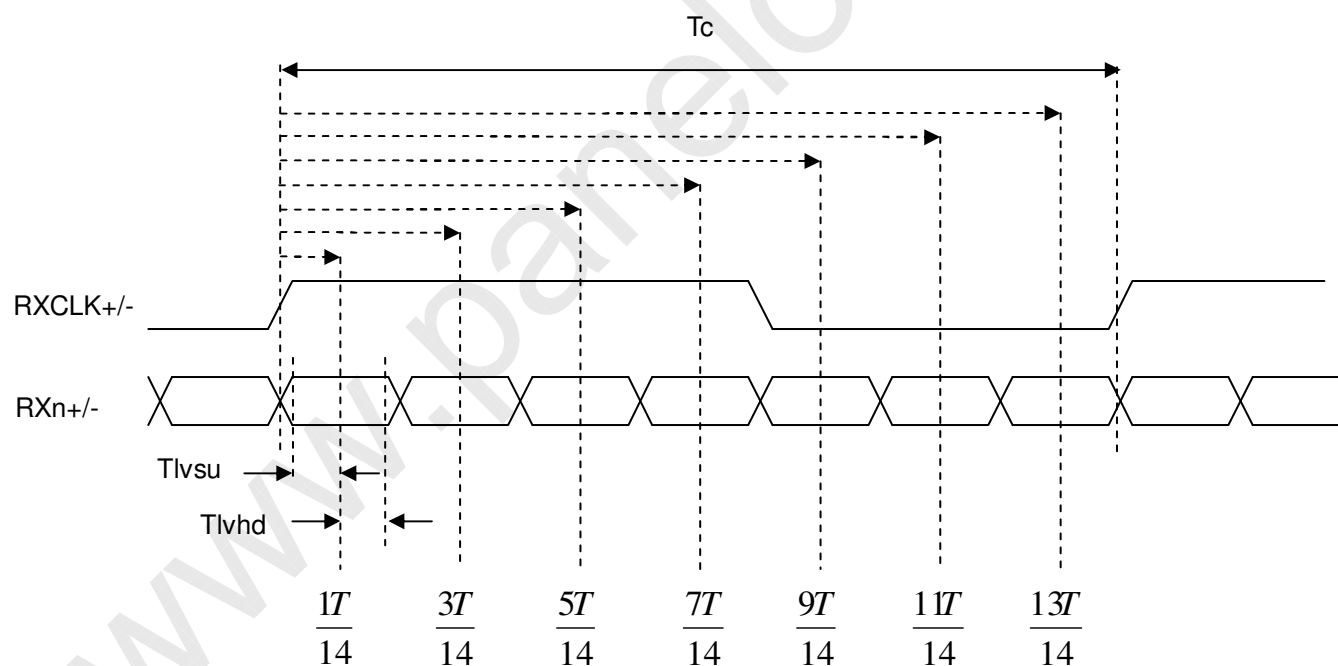Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I $T_1$ – TI

PRODUCT SPECIFICATION
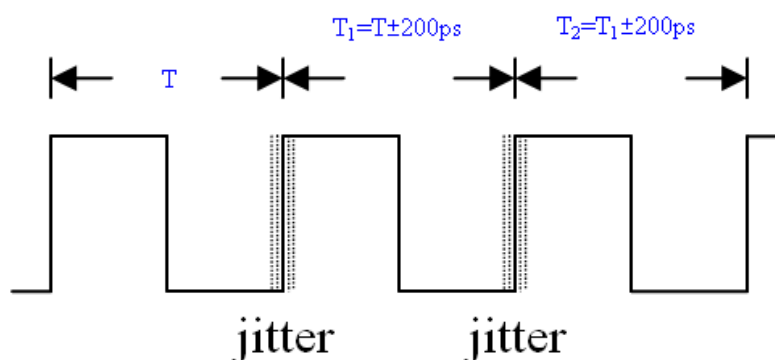
Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.

$$1/F_{SSM}$$

$F_{clkin\_mod(max)}$

$F_{clkin}$

$F_{clkin\_mod(min)}$

Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

**LVDS RECEIVER INTERFACE TIMING DIAGRAM**

Tc

RXCLK+/-

RXn+/-

Tlvsu

Tlvhd

$\dfrac{1T}{14}$    $\dfrac{3T}{14}$    $\dfrac{5T}{14}$    $\dfrac{7T}{14}$    $\dfrac{9T}{14}$    $\dfrac{11T}{14}$    $\dfrac{13T}{14}$

PRODUCT SPECIFICATION

## 6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.

$0.5 \leq T_1 \leq 10ms$
$0 \leq T_2 \leq 200ms$
$0 \leq T_3 \leq 1100ms$
$500ms \leq T_4$

**LVDS Signals**

$0 \leq T_7 \leq T2$
$0 \leq T_8 \leq T3$

**Option Signals**
(SELLVDS)

**Backlight (Recommended)**
$500ms \leq T_5$
$100ms \leq T_6$

Power On                    Power Off

**Power ON/OFF Sequence**
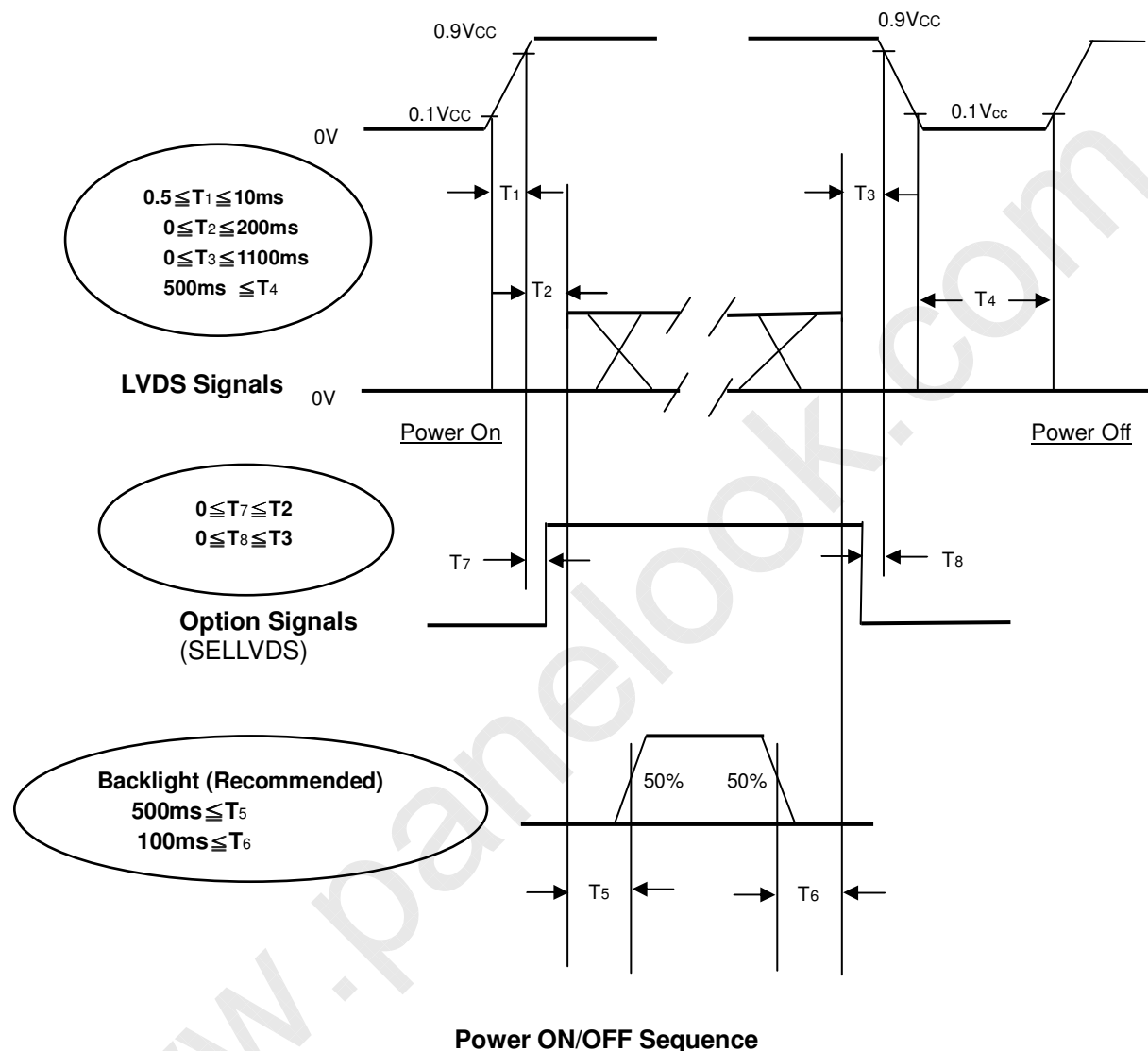
Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0,that maybe cause electrical overstress failure.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

## PRODUCT SPECIFICATION

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | $^o$C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | $V_{CC}$ | 12V | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| LED Current | $I_L$ | 100±6.0 | mA |

### 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | | 3750 | 5000 | | - | (2) |
| Response Time | | Gray to gray average | | - | 8.5 | - | ms | (3) |
| Center Luminance of White | | $L_C$ | | 320 | 400 | | cd/m$^2$ | (4) |
| White Variation | | $\delta$W | | - | - | 1.3 | - | (7) |
| Cross Talk | | CT | | - | - | 4.0 | % | (5) |
| Color Chromaticity | Red | Rx | $\theta_x$=0°, $\theta_Y$=0° Viewing Angle at Normal Direction | Typ -0.03 | 0.639 | Typ +0.03 | - | (6) |
| | | Ry | | | 0.328 | | - | |
| | Green | Gx | | | 0.289 | | - | |
| | | Gy | | | 0.601 | | - | |
| | Blue | Bx | | | 0.148 | | - | |
| | | By | | | 0.058 | | - | |
| | White | Wx | | | 0.280 | | - | |
| | | Wy | | | 0.290 | | - | |
| | Color Gamut | CG | | | 72 | | % | NTSC |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥20 | | 88 | - | Deg. | (1) |
| | | $\theta_x$- | | | 88 | - | | |
| | Vertical | $\theta_Y$+ | | | 88 | - | | |
| | | $\theta_Y$- | | | 88 | - | | |

PRODUCT SPECIFICATION

Note (1) Definition of Viewing Angle ($\theta$x, $\theta$y):

Viewing angles are measured by Autronic Conoscope Cono-80

Normal

$\theta$x = $\theta$y = 0º

$\theta$y-     $\theta$y+

$\theta$x- = 90º     x-

12 o'clock direction

$\theta$y+ = 90º

$\theta$x−     y+

$\theta$x+

6 o'clock     y-

$\theta$y- = 90º

x+     $\theta$x+ = 90º
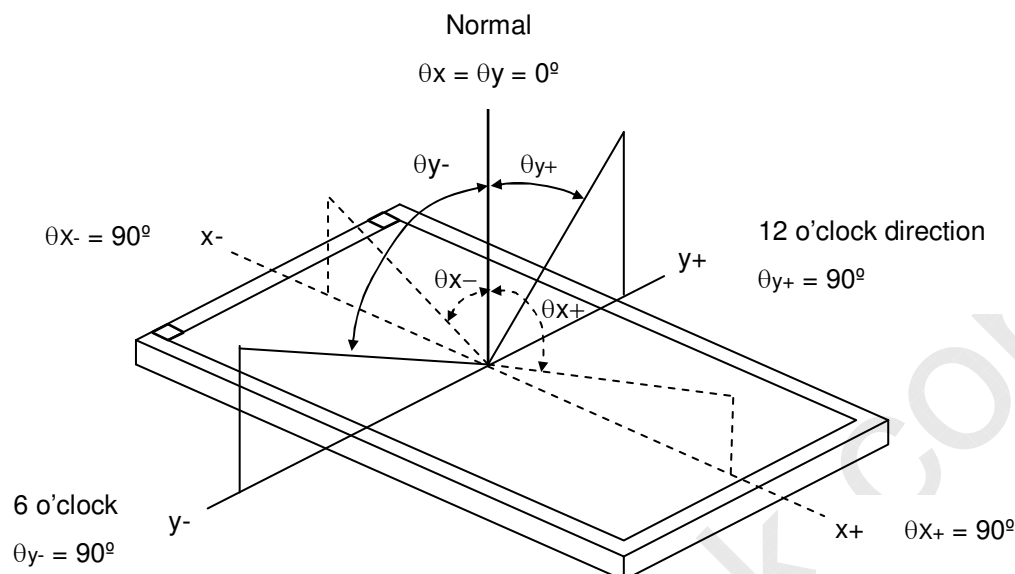
Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7)

Note (3) Definition of Response Time (Gray to Gray switching time):

100%
90%

Optical

Response

10%
0%

$T_R$     $T_F$     Time
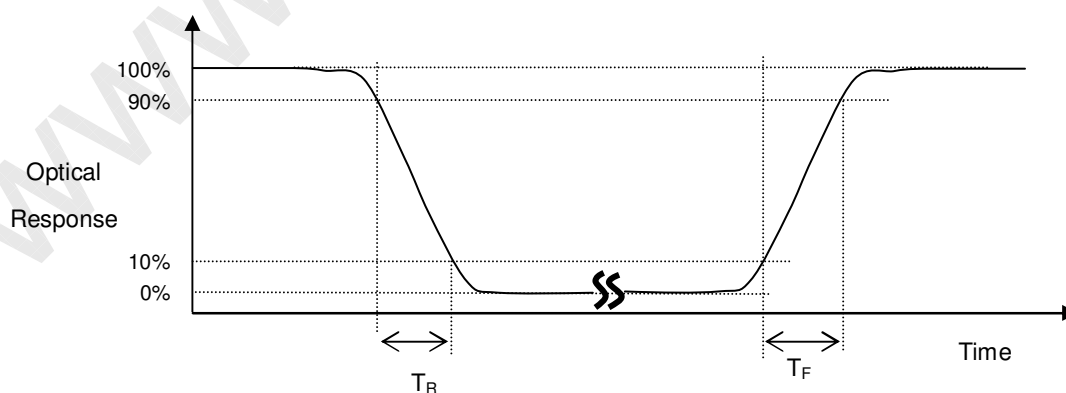
The driving signal means the signal of Gray 0, 31, 63, 95, 127,159, 191, 223, 255. Gray to gray average time means the average switching time of gray 0, 31, 63, 95, 127,159, 191, 223, 255 to each other.

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Note (4) Definition of Luminance of White ($L_C$):

Measure the luminance of gray level 255 at center point.

$L_C$ = L (5), where L (x) is corresponding to the luminance of the point X at the figure in Note (7).

Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100$ (%)

Where:

$Y_A$ = Luminance of measured location without gray level 0 pattern (cd/m$^2$)

$Y_B$ = Luminance of measured location with gray level 0 pattern (cd/m$^2$)
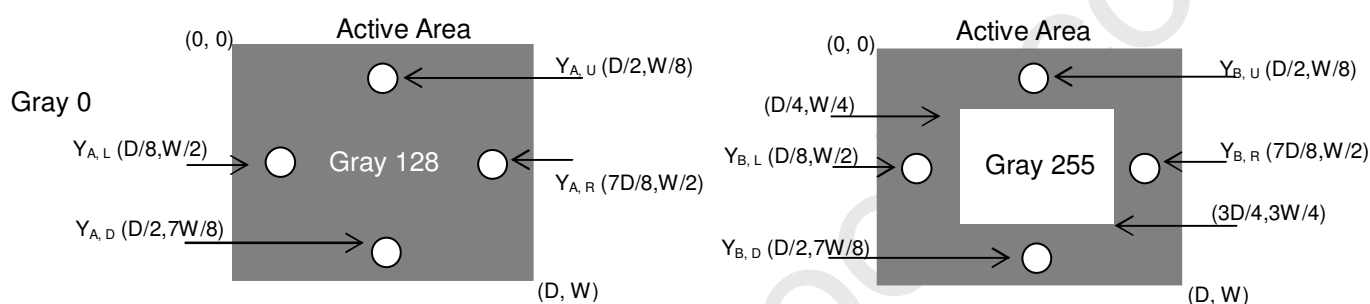


Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.

PRODUCT SPECIFICATION
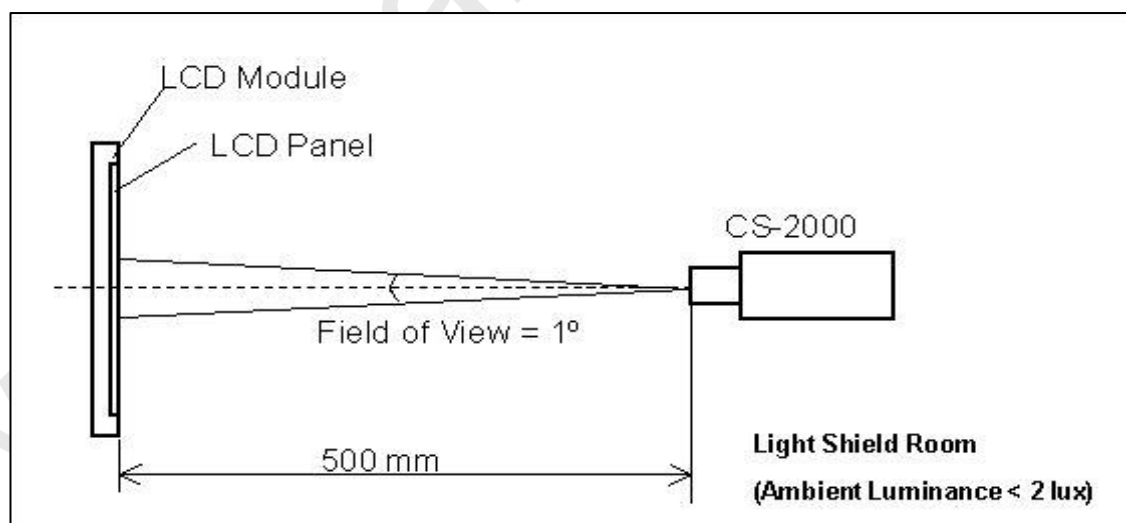
Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

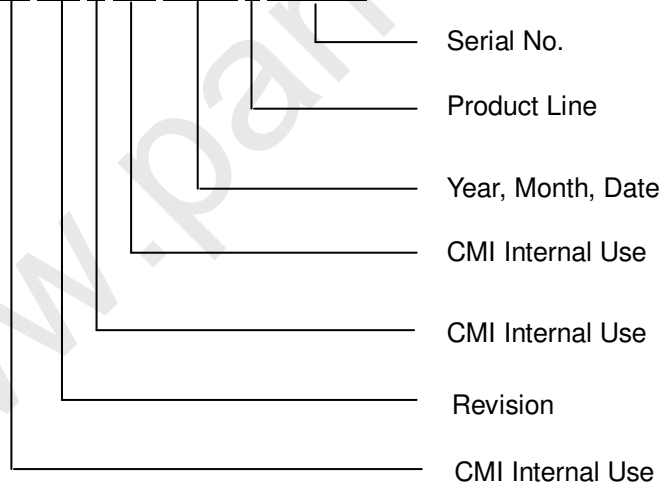δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line

D

D/4          D/2          3D/4

Vertical Line

W

W/4 ──────── ①          ②

W/2 ──────────── ⑤          Ⓧ : Test Point

X=1 to 5

3W/4 ──────── ③          ④

Active Area

PRODUCT SPECIFICATION
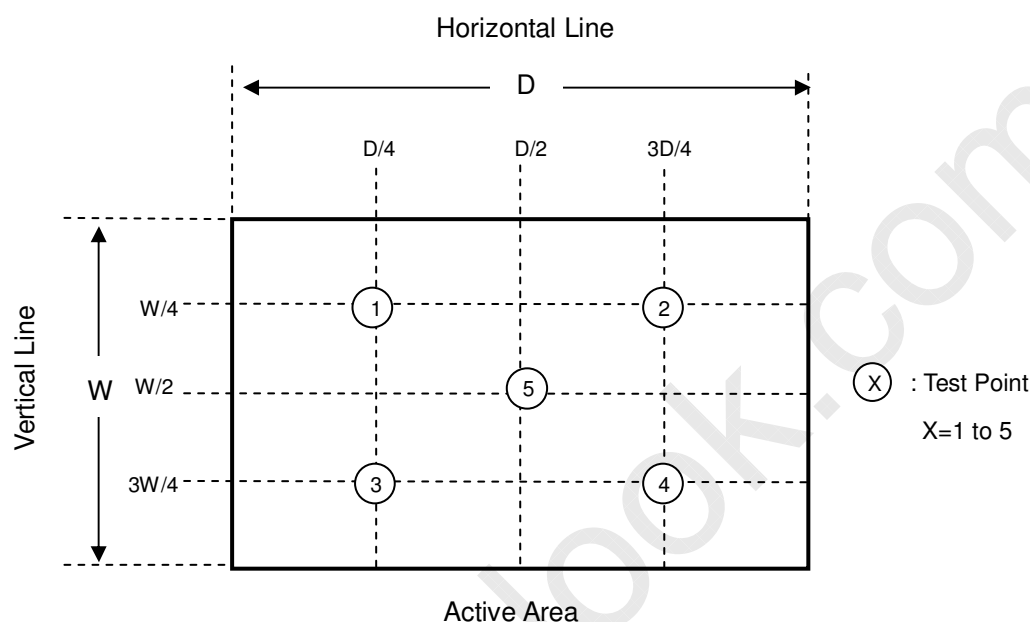
## 8. DEFINITION OF LABELS

### 8.1 CMI MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.
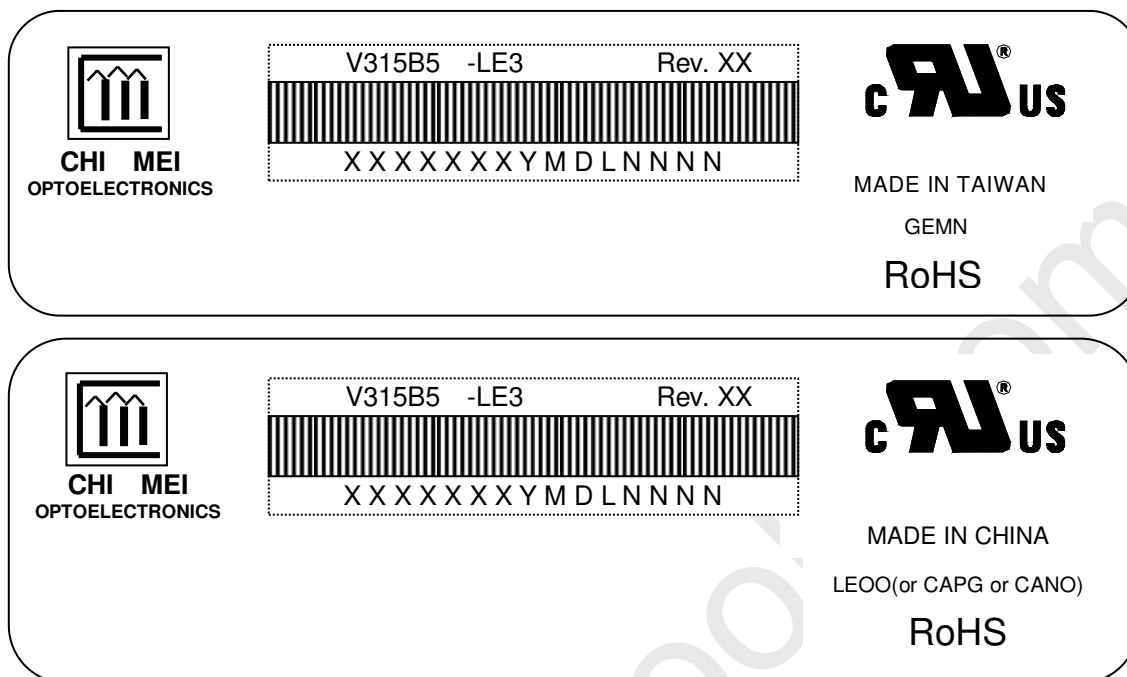


(a)　　Model Name: V315B5-LE3

(b)　　Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c)　　Serial ID: X X X X X X X Y M D L N N N N



- Serial No.
- Product Line
- Year, Month, Date
- CMI Internal Use
- CMI Internal Use
- Revision
- CMI Internal Use

Serial ID includes the information as below:

　　　　(a)　　Manufactured Date: Year: 0~9, for 2010~2019

　　　　　　　　　Month: 1~9, A~C, for Jan. ~ Dec.

　　　　　　　　　Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

　　　　(b)　　Revision Code: Cover all the change

　　　　(c)　　Serial No.: Manufacturing sequence of product

　　　　(d)　　Product Line: 1 -> Line1, 2 -> Line 2, …etc.

PRODUCT SPECIFICATION

# 9. PACKAGING

## 9.1 PACKING SPECIFICATIONS

(1) 7 LCD TV modules / 1 Box

(2) Box dimensions : 826(L)x376(W)x540(H)mm

(3) Weight : approximately 35 Kg (7 modules per box)

## 9.2 PACKING METHOD
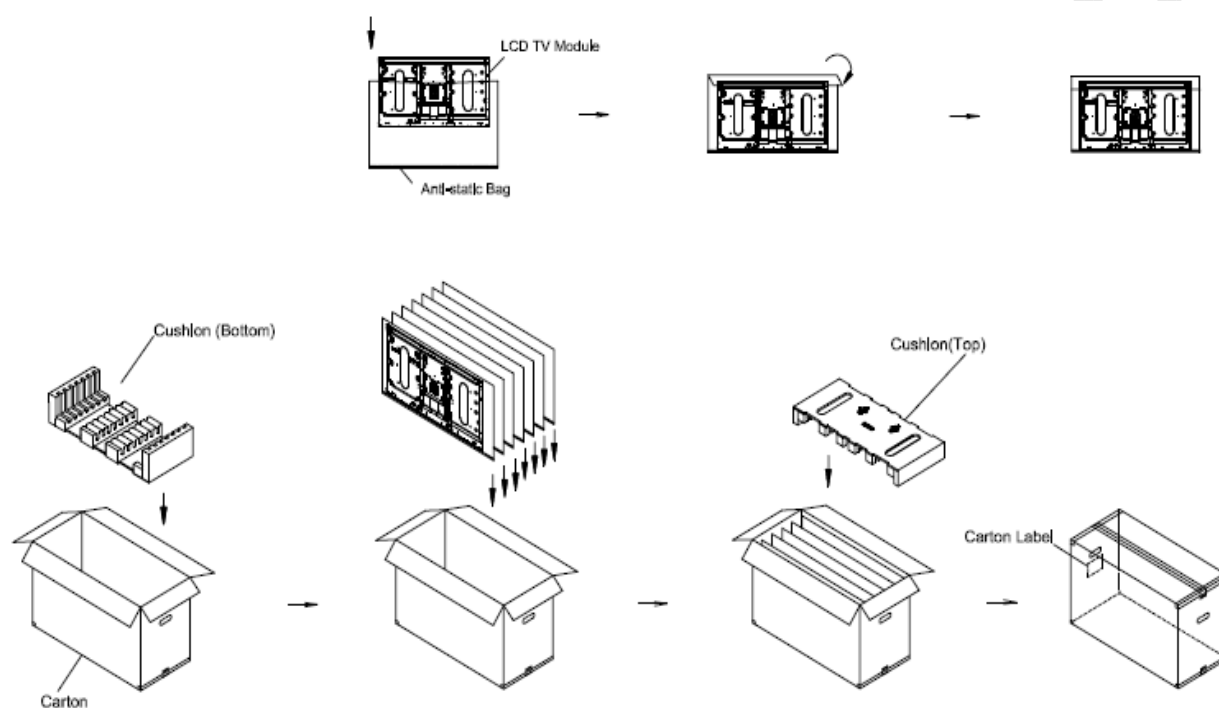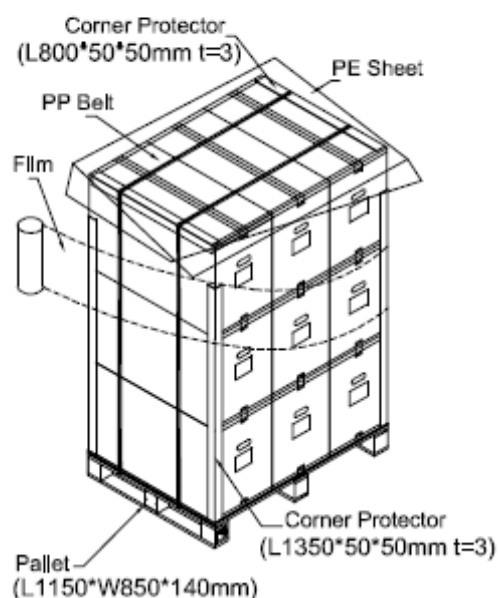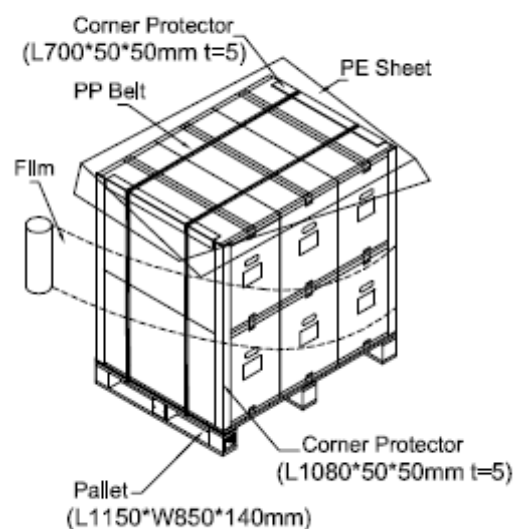
Figures 9-1 and 9-2 are the packing method



**Figure.9-1 packing method**

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

PRODUCT　SPECIFICATION
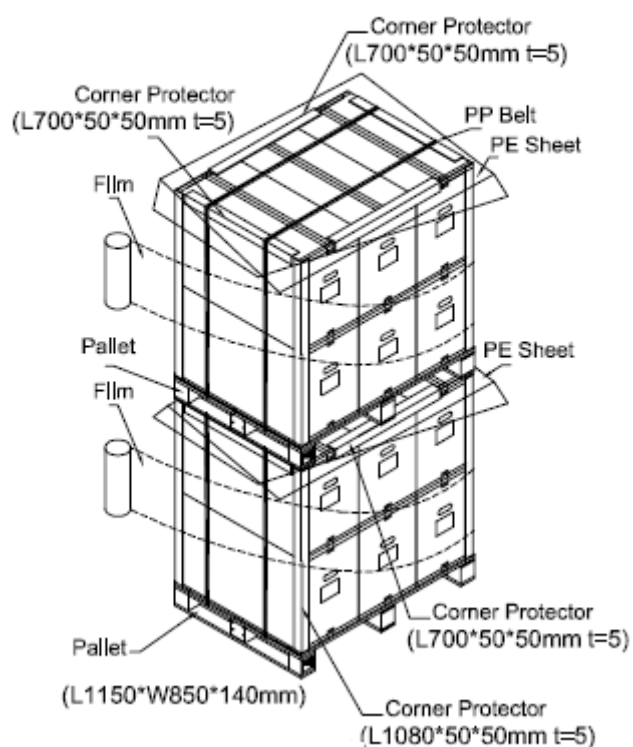


Figure. 9-2 Packing method

## 10. PRECAUTIONS

### 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1)  Do not apply rough force such as bending or twisting to the module during assembly.

(2)  It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3)  Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4)  Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5)  Do not plug in or pull out the I/F connector while the module is in operation.

(6)  Do not disassemble the module.

(7)  Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8)  Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9)  High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10)  When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow.

### 10.2 SAFETY PRECAUTIONS

(1)  The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(2)  If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3)  After the module's end of life, it is not harmful in case of normal operation and storage.

### 10.3 STORAGE PRECAUTIONS

When storing modules as spares for a long time, the following precaution is necessary.

(1) Do not leave the module in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35℃ at normal humidity without condensation.

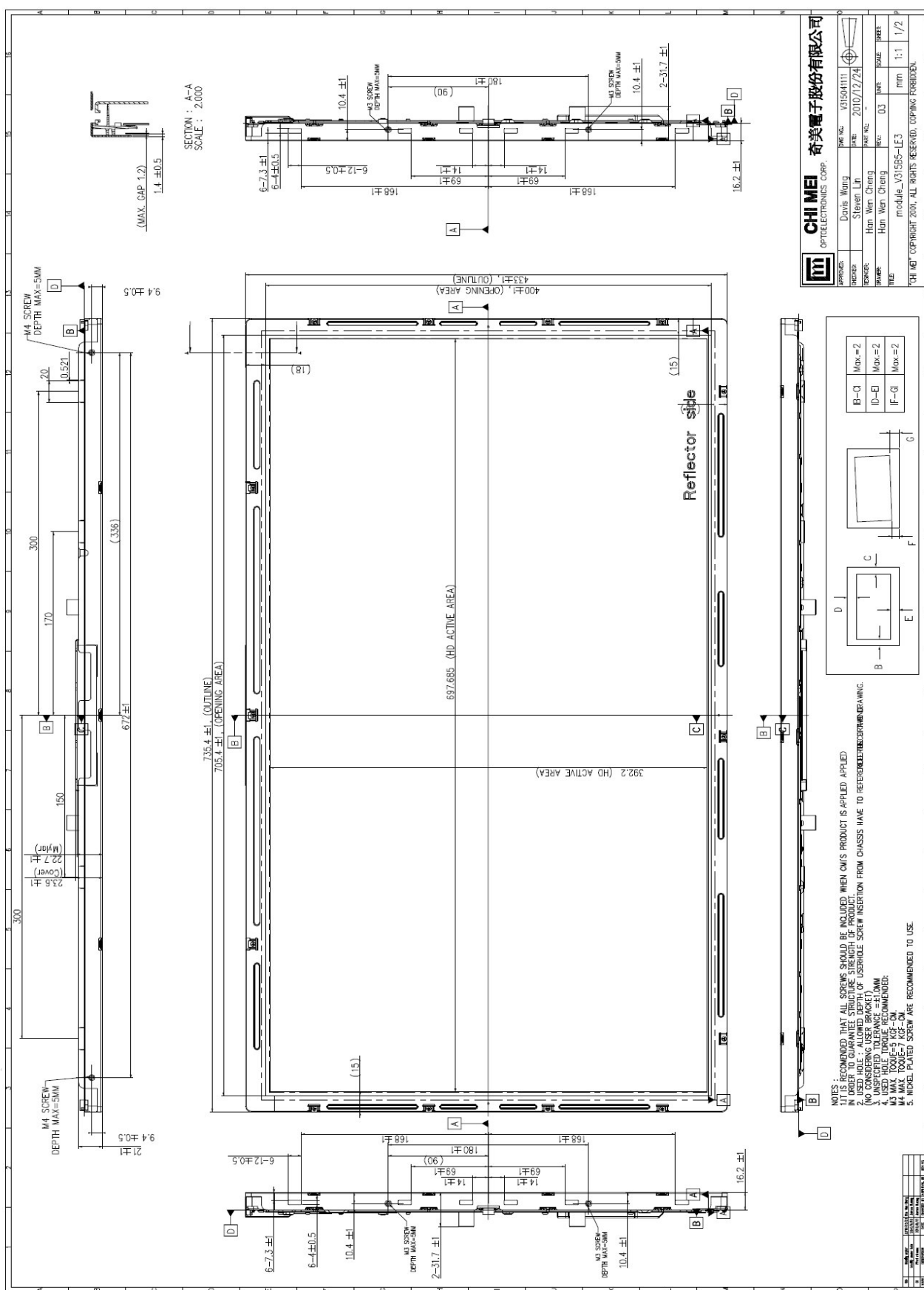(2) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

# PRODUCT SPECIFICATION

## 11. INTERNATIONAL STANDARD

### 11.1 SAFETY

(1) UL 60950-1, UL 60065 ; Standard for Safety of information Technology Equipment including electrical Business Equipment.

(2) IEC 60950-1:2001, IEC 60065:2001; Standard for Safety of International Electrotechnical Commission.

(3) EN 60950:2001+A11, EN 60065:2002+A1:2006; European Committee for Electrotechnical Standardization (CENCLEC), EUROPEAN STANDARD for Safety of information Technology Equipment including Electrical Business Equipment.

### 11.2 EMC

(1) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 4oGHz. " American National standards institute(ANSI), 1992

(2) C.I.S.P.R "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment. " International Special Committee on Radio Interference.

(3) EN55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment. "European Committee for Electrotechnical Standardization(CENCLEC) , 1998

PRODUCT SPECIFICATION

## 12. MECHANICAL CHARACTERISTIC

PRODUCT SPECIFICATION

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PRODUCT SPECIFICATION

PRODUCT  SPECIFICATION
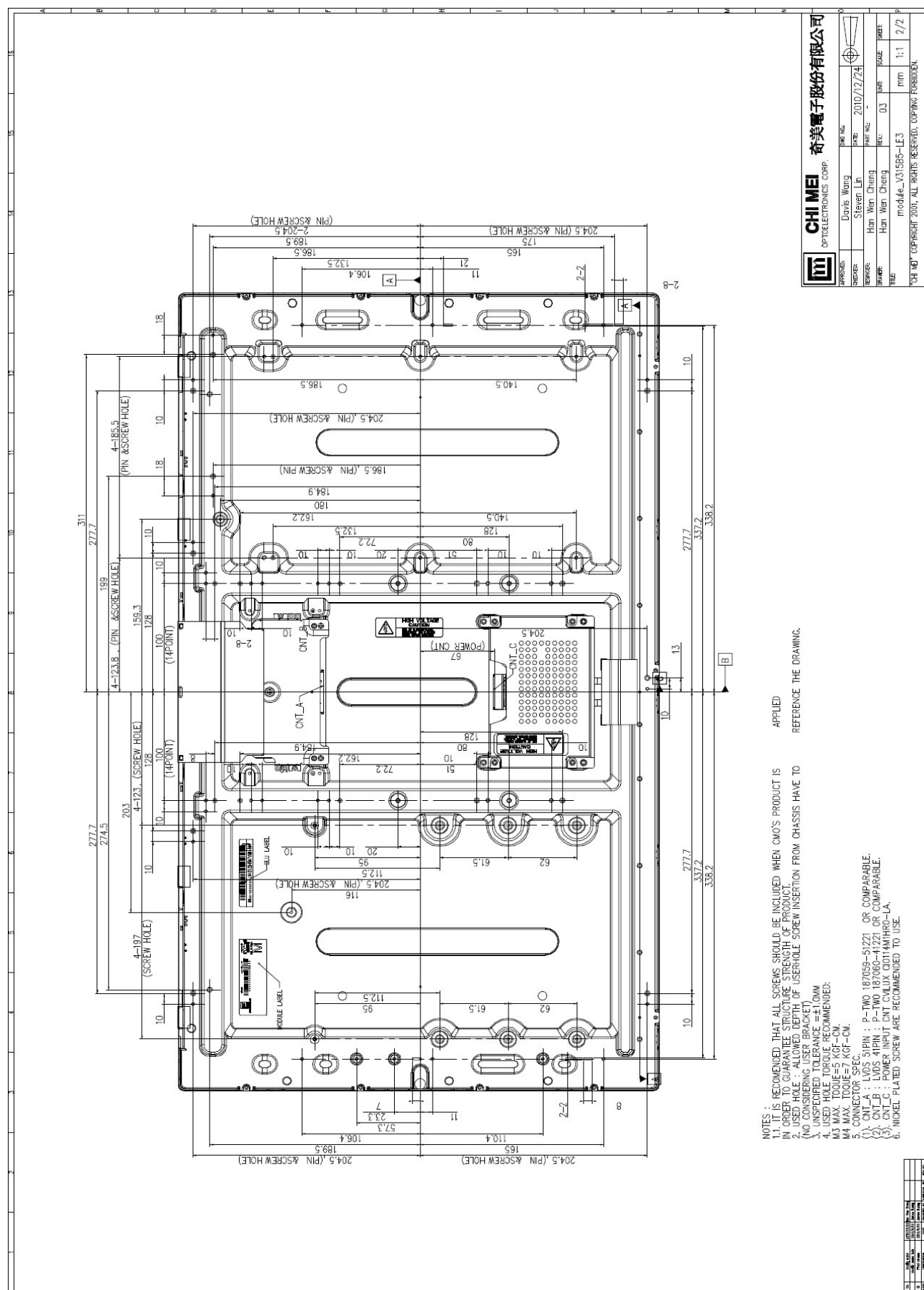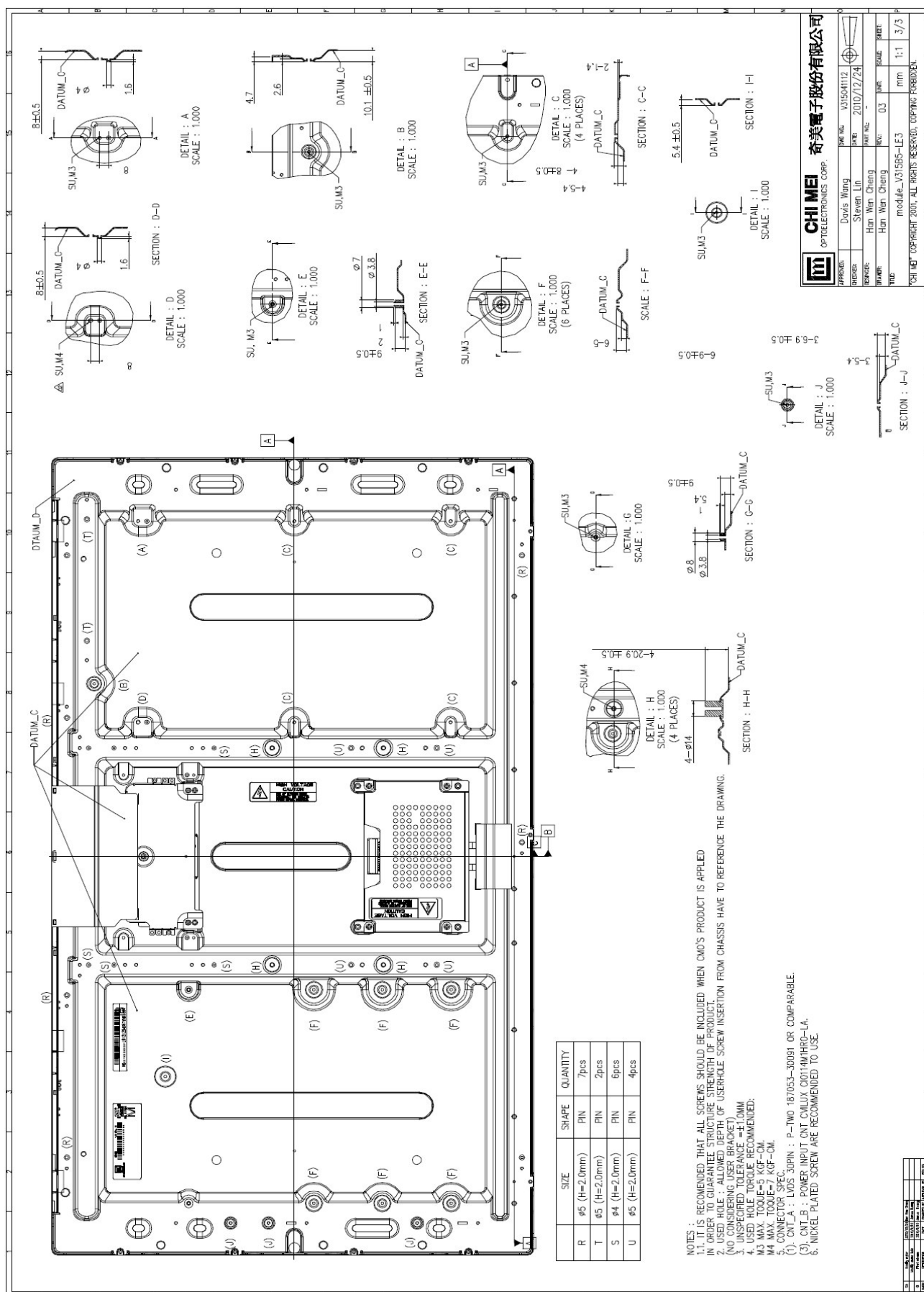
**Appendix：Reliability Test Items**

| | Test item | Q'ty | Condition |
|---|---|---|---|
| 1 | High temperature storage test | 3 | 60℃,240hrs |
| 2 | Low temperature storage test | 3 | -20℃,240hrs |
| 3 | High temperature operation test | 3 | 50℃,240hrs |
| 4 | Low temperature operation test | 3 | 0℃,240hrs |
| 5 | Vibration test(non-operation) | 3 | 10 ~200Hz, 1G, 10 minutes for 1 cycle, X, Y, Z, each direction for 1 time.(Test environment: 25℃) |
| 6 | Shock test(non-operation) | 3 | 50G, 11 ms, half sine wave, ±X, ±Y, ±Z direction, each direction for 1 time. (Test environment: 25℃) |
| 7 | Package Vibration | 1BOX | 1.14Grms Random frequency 1~200Hz 30min/Bottom, 15min/Right-Left, 15min/Front-Back |
| 8 | Package Drop | 1BOX | 1corner, 3edges, 6faces (1 time/direction), 44.01KG 31C |